

PHYSIOLOGICAL STRESS OF WOMEN WORKING IN PADDY TRANSPLANTION ACTIVITY

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ABSTRACT

The present paper examines the effect of season on the physiological stress of women working in paddy transplantation activity through a field study conducted by AICRP- Home Science, PJTSAU, Hyderabad. The sample size was thirty women belonging to 20-40 years. The activity was conducted both in Kharif and Rabi season consecutively. Physiological stress was assessed by recording heart rate with the help of a polar heart rate monitor for a period of four hours. Results indicated that transplantation caused 30 per cent additional physiological stress over rest in women which may due to working in prolonged bending posture. The stress was found to be significantly different between age groups and between seasons. The study draws that there is need to relieve women from poor postures adopted in transplantation with the help of technology, integrate nutritional intervention & physical training as stress coping mechanisms to improve their capacity to function.

KEYWORDS: Physiological Stress, Farm Women, Paddy Transplantation

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INTRODUCTION

Transplanting of rice is a labor intensive operation. In each cropping season there is an optimum period during which the paddy should be transplanted for obtaining good yield. The demand for manual labor would be at its peak during this period. Transplantation is done after the nursery is raised separately. When the seedlings are about four-leaf stage, they are first uprooted and transplanted in the puddle soil. Generally women manually transplant two or three seedlings at a time in a bending posture. Women continuously attend to this work from morning till evening. Women in different age groups, during the transplantation season, experience and report muscular pain in body parts. As paddy is cultivated in both Kharif and Rabi seasons, and by women in different age groups, the present study was conducted with the following specific objectives.

- To study the physical fitness of women involved in transplanting activity.
- To examine the physiological stress due to work on women
- To examine the effect of age and season on the physiological stress of women.

REVIEW OF LITERATURE

In India women carry out as much as 80 percent of the work in paddy production. They are involved right from seeding, transplanting, weeding, harvesting and processing to marketing of produce and buying the necessities of life. Women labor is exclusively used for transplanting, harvesting, stubble collection, threshing and winnowing. Sowing of paddy involves cleaning seeds for sowing, nursery sowing, caring the seedlings, uprooting and transplanting; all the works are solely performed by women. (Singh and Hensel, 2012).

Murali et al. (2007) reported that Vo_2 max of women was ranging from 16.1 to 64.8 ml/min with a mean value of 39.89 ml/min. and half of the respondents (50%) had very good physical fitness in the range of 41-45 ml/min.

A study was conducted by Jatinder and Aruna (2012) assessed the physiological workload and musculoskeletal problems of women both while working with traditional tools and with improved tools by employing physical fitness and physiological parameters. The results revealed that heart rate values were more than acceptable limits for task performed with the traditional tools as compared with improved tools. Significant reduction in the heart rate was observed while working with improved tools. Analysis of Musculo Skeletal Disorders indicated that the postural stress and severity of pain in various body parts was reduced by adopting new technology. Hence, the use of improved weeding tools was recommended over the existing ones for drudgery reduction.

Sawkar (1999) revealed that the mean heart rate of picking of stalks and stubbles, sowing, transplanting, inter culturing, weeding and harvesting of wheat and jowar crop were 101 b.min⁻¹, 110.60 b.min⁻¹, 118.60 b.min⁻¹, 131 b.min⁻¹, 109.10 b.min⁻¹, 126 b.min⁻¹ and 123 b.min⁻¹ respectively. A study conducted by Chhaya et al. (2004) in Hubli and Dharwad talukas of Dharwad district revealed that drudgery oriented agricultural operations of farm women were transplanting, carrying load on head, weeding, bund formation, harvesting and sowing. The circulatory stress and the physiological work load of farm women were observed to be lower while performing the selected activities viz., transplanting, carrying load on head, weeding, bund formation, harvesting and sowing with the improved technologies compared to the traditional technologies. The work output was also higher with the improved technologies except the improved chaff cutter.

Sawant et al. (2002) observed that among the identified farm activities harvesting of grass was the major activity, which provided employment to all the respondents. The farm activities such as weeding (97.84%), uprooting and transplanting the seedlings (96.40%) and harvesting of cereals (93.52%) also provided employment to the farm women labourers to a maximum extent.

METHODOLOGY

Field research trials were undertaken when subjects were actually involved in transplantation. Thirty subjects each from two age groups i.e., 20-30 and 31-40 years who were normal, non-pregnant, non-lactating and without any major illness and handicaps were selected for the study. The study was repeated both in Kharif and Rabi seasons in order to examine the effect of seasonal weather conditions on the workload of women. Physical fitness of the sample was assessed with the help of standardized step stool test (Varghese et al., 1996).

Stresses on the circulatory system were assessed by recording heart rate at every five minutes with the help of a polar heart rate monitor for a period of four hours. Initial resting heart rate and recovery heart rate were also recorded at every minute for five minutes. Environment variables like the ambient temperature, relative humidity and coverage of land

per unit time were also recorded. Mean, Standard deviations and test of significance were worked out for different parameters and data was interpreted indicating statistical evidence.

RESULTS AND DISCUSSIONS

The results of the field study conducted on transplantation activity were presented below

Status on Physical and General Health Attributes

The mean values on variables of physical examination viz., height, weight, lean body mass, oral temperature, pulse pressure, Basal Metabolic Index(BMI), Physical Fitness Index (PFI) for group I and group II during Rabi and Kharif were featured in Table 1 and 2 respectively for the farm women performing transplantation activity.

Table 1: Status on Physical Examination of the Subjects Participating in Transplantation Activity According to Season (Group I) N=30

Variable	Kharif		Rabi		T value
	Mean	S.D	Mean	S.D	
Height (cms)	152.4	5.90	152.4	4.08	
Gross weight (kg)	47.7	8.34	50.1	6.31	N.S
Lean Body Mass (kg)	34.48	7.44	35.72	6.73	N.S
Oral Temperature (⁰ F)	97.75	0.54	97.36	0.45	N.S
Pulse Pressure (mm/Hg)	36.3	14.76	39.09	3.70	N.S
Body Mass Index	20.27	3.02	21.54	2.29	N.S
Physical Fitness Index	88.52	18.62	75.14	2.23	3.90*
Rating on perceived exertion	4.2	0.42	3.6	1.17	2.64*
*Significant at 0.05 level					

Data denoted that subjects belonging to both the age groups were found as normal when verified against oral temperature, pulse pressure with no significant difference established statistically due to season. The lean body mass indicated poor muscular frame of the subjects. The observations and the rating on BMI and physical fitness showed prevalence of energy deficiency malnutrition, grade-I order and poor state of physical fitness. The PFI test and rating on perceived exertion demonstrated statistically significant difference as per season. All the above, indicate that subjects need to be physically trained for muscular work and for nutritional improvement. It can be inferred that women in agriculture demonstrated poor muscular fit to cope up with manual nature of tasks.

Table 2: Status on Physical Examination of the Subjects Participating in Transplantation Activity According to Season (Group II) n=30

Variable	Kharif		Rabi		T value
	Mean	S.D	Mean	S.D	
Height (cms)	150.45	5.96	152.20	5.39	
Gross weight (kg)	48.82	7.59	51.10	5.48	N.S
Lean Body Mass (kg)	36.69	5.32	38.95	3.95	N.S
Oral Temperature (⁰ F)	97.39	0.60	97.35	0.50	N.S
Pulse Pressure (mm/Hg)	42.0	4.69	41.90	2.80	N.S
VO2 Max (ml/kg/min)	34.82	4.09	36.10	2.75	N.S
Body Mass Index	21.51	3.19	21.84	2.34	N.S
Physical Fitness Index	86.41	16.78	69.06	12.99	4.47
Rate of perceived exertion	4.2	0.42	3.8	1.0	2.02
*Significant at 0.05 level					

Effect of Season on the Physiological Workload of Transplanting (Conventional Method)

The physiological work responses in terms of heart rate measured in kharif and rabi season for the 20-30 years and 31-40 years age groups were denoted in tables 3 and 4 respectively.

Table 3: Cardiac Stress Due to Paddy Transplantation Compared between Seasons in Group-1

Physiological Cost of Work-Transplantation (Group I) N=30					
Parameter	Kharif		Rabi		T-Value
	Mean	S.D	Mean	S.D	
Resting Heart Rate (bpm)	83.46	0.73	85.34	1.1	7.79*
Working Heart Rate (bpm)	112.46	6.95	108.39	7.37	2.20*
Cardiac Cost of Work (beats)	7029.92	1612.93	5531.28	1726.29	3.47*
Cardiac cost of Recovery (beats)	229	153.71	138.7	78.9	2.86*
Total Cardiac Cost of Work (beats)	7252.82	1672.08	5669.98	1718.1	3.61*
Physiological cost of work-Transplantation	27.38	6.33	21.39	6.48	3.62*
Energy Cost (kj/min)	9.16	1.12	8.51	1.22	2.14*
Total Energy Expenditure (kj)	1144.47	257.2	892.8	265	3.73*
Rating on Perceived Exertion	4.5	0.5	3.5	0.97	5.01*
Time (mins)	240	15.5	240	20.2	0.00 ^{NS}
Coverage of land (acres)	0.5	-	0.5	-	-
Ambient Temperature (C)	31.1	4.5	33.2	4.5	1.80 ^{NS}
Relative humidity (%)	70.75	4.3	34	4.2	33.4*

Resting Heart Rate, working heart rate, cardiac cost of work, recovery and physiological cost of work was found to be significantly influenced by the season in group-1 (21- 30 years). With regard to perceived exertion, the younger age group perceived the transplantation work as more difficult during Kharif season over Rabi. Energy cost per minute was also found to be influenced by season in group -1.

The observations suggested that transplantation activity was more exerting in Kharif compared to rabi season for the age group below 30 years. The differences observed may perhaps be due to low habituation to work load or the metabolic discomfort experienced among the younger age group during Kharif season.

Table 4: Cardiac stress Due to Paddy Transplantation Compared between Seasons in Group – II

Physiological Cost of work-Transplantation (Group II)					
Parameter	Kharif		Rabi		T-Value
	Mean	S.D	Mean	S.D	
Resting Heart Rate (bpm)	82.32	3.66	85.34	1.1	4.32*
Working Heart Rate (bpm)	114.97	6.99	114.97	9.1	0.00 ^{NS}
Cardiac Cost of Work (beats)	7938.34	2389.26	7288.54	2440.14	1.04 ^{NS}
Cardiac cost of Recovery (beats)	302.66	171	226.3	88.3	2.17*
Total Cardiac Cost of Work (beats)	8241.02	2527.2	7519.38	2465.4	1.11 ^{NS}
Physiological cost of work-Transplantation	30.25	9.43	28.37	9.3	0.77 ^{NS}
Energy Cost (kj/min)	9.56	1.12	9.56	1.45	0.00 ^{NS}
Total Energy Expenditure (kj)	1301.6	393.1	1186.86	351	1.19 ^{NS}
Rating on Perceived Exertion	4.5	0.5	4.2	0.92	1.56 ^{NS}
Time (mins)	240	20.6	240	16.7	0.00 ^{NS}
Coverage of land (acres)	0.5	-	0.5	-	-
Ambient Temperature (C)	31.1	4.7	30.6	4.6	0.41 ^{NS}
Relative humidity (%)	70.8	4.44	30	5.1	33.04*

Resting Heart Rate was found to be significantly influenced by the season, in age group- II, where ambient temperature was slightly more and humidity was low compared to Kharif. With respect to working heart rate, cardiac cost of work, physiological work load responses, season was not found to be significantly affecting in 31 – 40 years of age

group as the observable differences were not statistically confirmed. The perceived exertion and the energy cost per unit time were also not found to be influenced by season in group -II.

Energy cost per minute was found to be influenced by season indicating the two age groups expended more energy per unit time during Kharif compared to Rabi. The results are comparable to the estimate made by Nag et al., 1980, which projected upto 10.25KJ/min for men.

Effect of Age on the Physiological Workload of Transplanting (Conventional Method)

The physiological work responses in terms of heart rate measured as per age groups i.e 20-30 years and 31-40 years was denoted for the Kharif and Rabi seasons separately in table 5.

Table 5: Cardiac Stress of Paddy Transplantation Compared between Age Groups

Physiological Cost of Work-Transplantation (Kharif) N=30					
Parameter	Group I		Group II		T-Value
	Mean	S.D	Mean	S.D	
Resting Heart Rate (bpm)	83.46	0.73	82.32	3.66	1.67 ^{NS}
Working Heart Rate (bpm)	112.46	6.95	114.97	6.99	1.39 ^{NS}
Cardiac Cost of Work (beats)	7029.92	1612.93	7938.34	2389.26	1.72 ^{NS}
Cardiac cost of Recovery (beats)	229	153.71	302.66	171	1.75 ^{NS}
Total Cardiac Cost of Work (beats)	7252.82	1672.08	8241.02	2527.2	1.78 ^{NS}
Physiological cost of work-Transplantation	27.38	6.33	30.25	9.43	1.38 ^{NS}
Energy Cost (kj/min)	9.16	1.12	9.56	1.12	1.38 ^{NS}
Total Energy Expenditure (kj)	1144.47	257.2	1301.6	393.1	1.83 ^{NS}
Rating on Perceived Exertion	4.5	0.5	4.5	0.5	0.00 ^{NS}
Physiological cost of work-Transplantation (Rabi) N=30					
Parameter	Group I		Group II		T-value
	Mean	S.D	Mean	S.D	
Resting Heart Rate (bpm)	85.34	1.1	85.34	1.1	0.00 ^{NS}
Working Heart Rate (bpm)	108.39	7.37	114.97	9.1	3.07*
Cardiac Cost of Work (beats)	5531.28	1726.29	7288.54	2440.14	3.22*
Cardiac cost of Recovery (beats)	138.7	78.9	226.3	88.3	4.05*
Total Cardiac Cost of Work (beats)	5669.98	1718.1	7519.38	2465.4	3.37*
Physiological cost of work-Transplantation	21.39	6.48	28.37	9.3	3.37*
Energy Cost (kj/min)	8.51	1.22	9.56	1.45	3.03*
Total Energy Expenditure (kj)	892.8	265	1186.86	351	3.66*
Rating on Perceived Exertion	3.5	0.97	4.2	0.92	2.86*

The working heart rate (WHR) in both the age groups was beyond 110 bpm, irrespective of season, which was not in acceptable limits for a worker putting in 8 hours work as per the study by Gite & Singh, 1997 ; and in such cases, work to the worker was considered as moderately heavy (Varghese et.al 1994). The results were not statistically significant between age groups in case of variables such as RHR, WHR, cardiac cost of recovery, physiological cost of work, energy per unit time in Kharif whereas effect of age group was significantly confirmed in Rabi season. The perceptions on exertion expressed by older age groups also varied as per age group. It can be inferred that older age groups were differing in cardiac responses affected by season when both the groups were examined

CONCLUSIONS

It was concluded that the general health of the subjects chosen for observation was found as normal, but their vulnerability to health impairments can be visualized from their poor body mass, BMI and Physical Fitness scores, which ranged from low average to low. Working heart rate and the cardiac cost of paddy transplantation for women was high, as

per acceptable limits but both the age groups, varied significantly due to season. As per the physiological cost of work (PCW) group -2 indicated more physiological cost, with significant difference between seasons statistically confirmed during Rabi season, indicating higher cardiac stress responses in Group II. The perceptions on exertion expressed by older age groups did not vary as per season, perhaps, due to variation into fatigue during work.

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